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"Your Regulatory Compliance Expert"

August 29, 2019

John M. Vollmer
Sr. Manager, Animal Resources Operations
JACKSON LABORATORY
1650 Santa Ana Avenue
Sacramento, California 95838

Subject: **RESULTS OF ETHYLENE OXIDE SOURCE TESTING PERFORMED AT THE JACKSON LABORATORY IN SACRAMENTO, CALIFORNIA**

Dear Mr. Vollmer:

Please find attached the results of the biennial ethylene oxide source testing and leak testing performed at your facility on Thursday, August 29, 2019, by ECSi. These test results are to be kept with all records pertaining to Sacramento Metropolitan Air Quality Management District (SMAQMD) required testing of the EtO gas-sterilization system, and are to be made available upon request by the SMAQMD. A copy of all raw test data, complete with sample chromatograms and calibration data, will be maintained in our files, and will be made available upon request.

Testing was performed in accordance with the SMAQMD and CARB requirements. The EtO concentration at the inlet and outlet of the emission-control device was measured simultaneously following the procedures delineated in CARB Method 431. During the source test, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify emissions at the emission-control device inlet, and a photoionization detector (PID) was used to quantify emissions at the emission-control device outlet.

The test results show that you continue to operate your EtO sterilization and emission-control system in compliance with SMAQMD regulatory requirements, and with the requirements specified in your SMAQMD Permit. The emission-control device demonstrated an EtO control efficiency of 99.99% (the requirement is 99.0%). The entire system was also found to be leak free.

If you have any questions or comments regarding this submittal, please contact me at (949)400-9145. We thank you for the opportunity to serve your needs.

Respectfully Submitted:

Daniel P. Kremer
ECSi

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TABLE 1
ETHYLENE OXIDE CONTROL EFFICIENCY
OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE
OPERATED BY THE JACKSON LABORATORY
IN SACRAMENTO, CALIFORNIA
ON AUGUST 29, 2019

CYCLE PHASE	INJECTION TIME	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
Exhaust(3)	1146	2090	0.01	99.9995
Exhaust	1149	1770	0.01	99.9994
Exhaust	1152	1610	0.01	99.9994
Exhaust	1155	1450	0.01	99.9993
Exhaust	1158	1380	0.01	99.9993
Exhaust	1201	1240	0.01	99.9992
Exhaust	1204	1100	0.01	99.9991
Exhaust	1207	1020	0.01	99.9990
Exhaust	1210	2110	0.01	99.9995
Exhaust	1213	1560	0.01	99.9994
Exhaust	1216	1140	0.01	99.9991
Exhaust	1219	1490	0.01	99.9993
Exhaust	1222	1010	0.01	99.9990
Exhaust	1225	896	0.01	99.9989
Exhaust	1228	624	0.01	99.9984
Exhaust	1231	438	0.01	99.9977
Exhaust	1234	236	0.01	99.9958
Exhaust	1237	151	0.01	99.9934
Exhaust	1240	104	0.01	99.9904
Exhaust	1243	75.3	0.01	99.9867
TIME-WEIGHTED AVERAGE:		**1075**	**0.0100**	**99.9976**
		SMAQMD REQUIRED CONTROL EFFICIENCY:		**99.0**

Notes:
(1) - PPM = parts per million by volume
(2) - 0.01 ppm is the quantification limit for the detector used at the outlet.
(3) - The exhaust phase started at 11:44, ended at 12:44.

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TABLE 2
ETHYLENE OXIDE MASS EMISSIONS
FROM A GAS STERILIZATION AND EMISSION CONTROL SYSTEM
OPERATED BY THE JACKSON LABORATORY
IN SACRAMENTO, CALIFORNIA
ON AUGUST 29, 2019

CYCLE PHASE	STACK FLOW(1)	OUTLET ETO MASS FLOW(2)	MINUTES/ CYCLE	CYCLES/ YEAR	ANNUAL ETO MASS EMISSIONS(3)
Exhaust	49.8 DSCFM	0.00000006 lbs/min	60	260	0.0009 lbs/year
		TOTAL ANNUAL ETO MASS EMISSIONS			**0.0009 lbs/year**

Notes:
(1) - DSCFM = Dry Standard Cubic Feet per Minute
(2) - lbs/min = pounds per minute
(3) - lbs/year = pounds per year

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TABLE 3
ETHYLENE OXIDE LEAK TESTING
OF A GAS STERILIZATION SYSTEM
OPERATED BY THE JACKSON LABORATORY
IN SACRAMENTO, CALIFORNIA
ON AUGUST 29, 2019

COMPONENT GROUP TESTED	LEAKING COMPONENTS FOUND	CONCENTRATION
Gas Cartridge / Injector	None	<1.0 ppm (1)
Sterilizer Inlet / Inbleed Valve	None	<1.0 ppm
Door Seal	None	<1.0 ppm
Sterilizer Outlet / Chamber Drain	None	<1.0 ppm
Venturi System / Filter	None	<1.0 ppm
Emission Control Device Inlet	None	<1.0 ppm

Notes:
(1) - PPM = parts per million by volume

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Ethylene Oxide Mass Emissions Data and Calculations

The Jackson Laboratory - Sacramento, CA - August 29, 2019

DeltaP	SqRtDeltaP	Temp (F)	ppm EtO
	Exhaust Phase		
0.005	0.0707	254	0.01
0.005	0.0707	259	0.01
0.005	0.0707	268	0.01
0.005	0.0707	282	0.01
0.0075	0.0866	299	0.01
0.0075	0.0866	317	0.01
0.0075	0.0866	325	0.01
0.0075	0.0866	326	0.01
0.0075	0.0866	324	0.01
0.0075	0.0866	328	0.01
0.0075	0.0866	325	0.01
0.0075	0.0866	320	0.01
0.0075	0.0866	316	0.01
0.0075	0.0866	312	0.01
0.005	0.0707	308	0.01
0.005	0.0707	305	0.01
0.005	0.0707	303	0.01
0.005	0.0707	297	0.01
0.005	0.0707	292	0.01
0.005	0.0707	288	0.01
Average =			
0.0063	0.0787	302	**0.0100**
		= 762	degR

stack ID =	6	in.
stack area =	0.196	sq. in.
press =	29.85	in. Hg
Tstd =	528	deg R
Pstd =	29.92	in Hg
Cp =	0.99	
Kp =	85.49	
Velocity =	6.30	ft/sec
Flow =	**49.8**	**dscfm**
MWeto =	44.05	
MolVol =	385.32	
ppmv/ft3 =	1000000	
EtO Mass Flow (Exh) =	**0.00000006**	**lbs/min**
min/cycle =	60	
cycles/year =	260	
Annual EtO Emissions =	**0.0009**	**lbs/year**